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Manufacturing & analysis of mechanical properties for natural hybrid composite material

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ABSTRACT

Composite material is the combination of two or more materials high are having same or different properties. In recent days, automobile and construction industries are focus on the light weight, eco-friendly materials, better mechanical properties therefore Natural Fiber Composites are used. There are different composite materials used in many applications and in engineering structures. In this work we are going to use the Natural Fiber Composites. Such banana and glass fiber. Fiber composites have suitable mechanical properties. In for general applications natural fibers exhibit lower mechanical properties than their synthetic counter parts as Well as have a high degree of fiber to fiber mechanical variability based on growing conditions and plant varieties inch lowers their mechanical performance predictability.In this work we use composites of Bananna+Jute+Glass In this work, different test such as tensile, Impact, Water Absorption and Flexural tests were done. Three samples of each material mentioned in this work were made for different testing. Dimensions for tensile, impact and flexural components are as per ASFM D-638:2014. AS FM ASTM D790:2017 and ASTM D256:2010e1 respectively. Tensile and Flexural Test were done on TUN! Machine. Vibration test is carried out by using FFT analyser. For this specimen is mounted as cantilever beam and vibration is given modal hammer. Further results of natural frequency of this test are stored in memory device such as computer. Impact test was done by lzode testing method. All these test results were carried out by using numerical analysis such as FEM method. FEM coffin are such as ANSYS 17.0 was used for carrying out these tests. By comparing above results numerically and experimentally, we found that there is good agreement bete cell numerical results as well as experimental results and also carbon fiber become better material among the mentioned material except cost of it.

Keywords: Banana, Glass, Jute, mechanical Properties.

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I. INTRODUCTION

The advanced composite materials such as graphite, carbon, Kevlar and Glass with suitable resins are widely used because of their high specific strength (strength/density) and high specific modulus (modulus/density). The automotive industry is exploiting composite material technology for structural components construction in order to obtain the reduction of the weight without decrease in vehicle quality and reliability. It is known that energy conservation is one of the most important objectives in vehicle design and reduction of weight is one of the most effective measures to obtain this result. Actually, there is almost a direct proportionality between the weight of a vehicle and its fuel consumption, particularly in city driving. Composites consist of two or more materials or material phases that are combined to produce a material that has superior properties to those of its individual constituents. The constituents are combined at a macroscopic level and or not soluble in each other. The main difference between composites, whereas in alloys, constituent materials are soluble in each other and

form a new material which has different properties from their constituents.

II. PROBLEM STATEMENT

Today many fibers are present in the world such as graphite, carbon, Kevlar, glass etc. But the problem is they are not disposable that's why then it effects on to the environment because of its heavy weight.

To overcome this, many researches are focusing on the natural composites material. Banana, Jute and glass fiber is the material, which is more competent to the composite materials. It is required to investigate the mechanical properties of composite fiber with different fiber rate, fiber length and fiber orientation.

III. OBJECTIVES

- To develop new composite.
- To find mechanical properties of composite materials.
- FEA Analysis of each composite specimen.
- Compare results of individuals.

IV. WORKING METHODOLOGY

1. Making of banana fiber, jute fiber and glass fiber and composite fiber component with required orientations.
2. FEA Analysis of each composite materials specimens by using ANSYS.
3. Experimental analysis of fabricated components (Tensile, Flexural, Impact and Water absorption tests).
4. Tabulating results and comparison for which is the best.
5. Conclusion

V. MANUFACTURING TECHNIQUES FOR FIBER COMPOSITES

A variety of manufacturing techniques have been developed to produce composites, such as film stacking, vacuum infusion, hand lay-up, compression moulding, filament winding, manual winding, resin transfer moulding (RTM), injection moulding, and pultrusion.

Hand Lap up Technique

1. Firstly apply plastic on the lower plate.
2. Then mixture of resin and hardener known as matrix is applied on plastic which is on the surface of glass.
3. Lay the fiber sheets on the matrix.
4. Again apply matrix on fiber sheet.
5. Put another fiber sheet over it.
6. Repeat the above procedure for the fibers for several times.
7. Again brush the plastic with wax coating.
8. Enclose the entire generated stack by the upper plate.
9. Apply weight of 5-6 kg on the stacking.
10. Let the curing period be for 24 hrs.

Fig.1 Hand Lap Up Technique for Composite

Die for composite Fabrication

Made a die for constructing composite components by using two rectangle glasses. This glass has 12mm thickness and 18 X 18 inch surface. There stitching by using nut-bolt.

Fig.2 Die for Composite Fabrication

ADVANTAGES

1. High strength to weight ratio
2. High stiffness to weight ratio
3. High impact resistance
4. Better fatigue resistance
5. Improved corrosion resistance
6. Good thermal resistance
7. Good thermal conductivity
8. High damping capacity

DISADVANTAGES

1. The fabrication cost of composites is high.
2. Rework and repairing are difficult.
3. They do not have a high combination of strength and fracture toughness as compared to metals.

APPLICATION

1. Automotive: Drive shafts, clutch plates, engine blocks, frames, automotive racing brakes.
2. Aircraft: Drive shafts, rudders, elevators, bearings, landing gear doors, panels and floorings of airplanes etc.

3. Space: payload bay doors, remote manipulator arm, high gain antenna, antenna ribs and struts etc.
4. Marine: Propeller vanes, fans & blowers, gear cases, valves &strainers, condenser shells.
5. Electrical & Electronics: Structures for overhead transmission lines for railways, Power line insulators.

VI. CONCLUSION

- From above work it can be conclude that composite fibers are economical and having better mechanical properties.
- During tensile and flexural test, tensile strength and flexural strength of composite fiber is greater than banana, jute and glass fiber.
- Composite fiber is better material for industrial as well as domestic application than other material.

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